BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

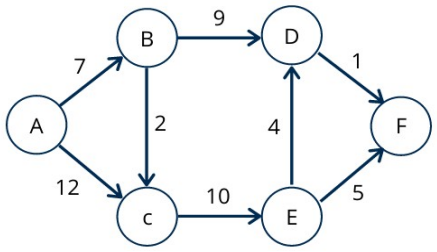
CLASS: BCA **SEMESTER : II/VI**
BRANCH: BCA **SESSION : MO/2023**

SUBJECT: CA157 DISCRETE STRUCTURES

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	What are conditional statements? Show that $\left[\left(p \Rightarrow q\right) \wedge \left(r \Rightarrow s\right) \wedge \left(p \vee r\right)\right] \Rightarrow \left(q \vee s\right)$ is tautology	[5]	1	1,2
Q.1(b)	Prove the statement is true by using mathematical induction $1^2 + 3^2 + 5^2 + - - - + (2n-1)^2 = \frac{n(2n+1)\ (2n-1)}{3}$	[5]	2	2
Q.2(a)	Define permutation and combination. How many committees of five students can be chosen from 30 boys students and 22 girls students? (a) if exactly three boy's students must be on each committee? (b) If exactly four girl's students must be on each committee?	[5]		
Q.2(b)	Solve the recurrence relation $d_n = 4d_{n-1} - 4d_{n-2},\ d_1 = 1\ d_2 = 7$	[5]	2	3
Q.3(a)	Let X = {2, 3, 6, 12, 24, 36} and relation ≤ be such that x ≤ y if x divides y. Draw Hasse diagram of (X, ≤).	[5]	3	4
Q.3(b)	If (L_1, ≤) and (L_2, ≤) are lattices then ($L_1 \times L_2$, ≤) is a lattice and the partial order ≤ of L is the product partial order	[5]	5	3
Q.4(a)	Let (T, v_0) be a rooted tree. Then (a) there are no cycles in T. (b) v_0 is the only root of T. (c) Each vertex in T, other than v_0, has in-degree one, and v_0 has in-degree zero.	[5]	4	5
Q.4(b)	Find the Shortest path using Dijkstra Algorithm in vertices A and F.	[5]	3	5



Q.5(a)	Let G be a group and let a and b be the element of G. Then prove (a) $(a^{-1})^{-1} = a$ (b) $(a\ b)^{-1} = b^{-1}\ a^{-1}$.	[5]	4	5
Q.5(b)	Write short notes on (a) Ring (b) field (c) Abelian Group.	[5]	1	1

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